

Name: \_\_\_\_\_

## **NASA Tropical Rainfall Measuring Mission (TRMM)**

### **TOPIC #1: TRMM: Why Measure Rainfall from Space?**

#### **Activity #1: The Issue of Global Warming - How Can TRMM Help?**

National Science Content Standards A,B,D,E,F & G

#### **WHAT'S HAPPENING?**

Scientists are concerned that in the future ocean levels could slowly rise and flood lowland areas such as the lower half of Florida. Imagine the entire city of Miami underwater. Where would all the people go? The rise in ocean levels could occur if the atmosphere becomes warmer, and the Earth's glaciers and polar ice caps begin to melt. Scientists believe that the slow rise in the temperature of the Earth's atmosphere may be due to the burning of coal in power plants and the burning of gasoline in automobiles. The burning of coal and gasoline gives off a gas called carbon dioxide. Carbon dioxide absorbs more heat from the sun than other gases presently in the atmosphere. A warmer atmosphere could also result in changes in rainfall causing floods in some areas, droughts in other areas, and an increase in the number of hurricanes. However, scientists need more information about the amount of heat in the Earth's atmosphere in order to make accurate climate predictions with their computer models. Without dependable computer models, governments are reluctant to pass laws which would reduce the burning of coal and gasoline. Such laws may cause our daily routines to be less comfortable if people are encouraged to use buses instead of cars. To help scientists gather more information, NASA scientists have launched the Tropical Rainfall Monitoring Mission satellite called TRMM. This information may provide better computer models for understanding the effects of Global Warming.

Research has shown that most (3/4) of the heat from the sun is absorbed by the oceans. The heat from the sun causes the warm water to evaporate or change to a gas called water vapor. The heat energy is now "stored" as energy of motion as the molecules vibrate more rapidly as a gas. This invisible "stored energy" of motion is called "latent heat energy". Just like a hot air balloon rises, the warm water vapor rises and begins to cool in the cold, upper atmosphere. The cold temperatures cause the water vapor to condense or change from a gas to liquid that becomes clouds or rain. When the water condenses it transfers the stored or latent heat energy to the surrounding atmosphere. Therefore, scientists have learned that whenever it rains, heat is being added to the atmosphere. If they monitor rainfall, they are indirectly monitoring the added heat. Since 64% of the Earth's rainfall occurs near the equator or the tropics, scientists have focused their TRMM rainfall monitoring instruments on the tropical regions of Earth. It is hoped that from the TRMM satellite's distant position in space it can monitor rainfall more thoroughly and consistently than would be possible by ground based rain gauges. Just imagine how difficult it would be to place rain gauges throughout the tropics around the world and measure all the rain! With this new data scientists hope to run more accurate computer models to predict changes in our global climate.

**YOUR THOUGHTS**

1. List reasons why we are concerned about global warming. List reasons why we do not want to reduce the burning of coal and oil until we are certain global warming will occur. (This topic could be used as class debate)
2. What are scientists indirectly monitoring when they measure rainfall?
3. How is measuring rain from space better than using rain gauges on the ground?